# Quantitative Pupillometry Data After Adult Cardiac Arrest: An Observational Study

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Abstract

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**Introduction/Hypothesis:**

The absence of the pupillary light reflex 72 hours after recovery of spontaneous circulation (ROSC) after cardiac arrest is useful to predict poor neurological outcome. Manual pupillary examination is generally scored as a dichotomous variable (present vs absent), sometimes described as brisk or sluggish, and often confounded by interobserver discrepancies. Quantitative pupillometry utilizes a standard infrared light stimulus to obtain objective measurements of pupil size and reactivity. This observational study reports the results for pupillometry added to a targeted temperature management (TTM) protocol for adult, comatose, cardiac arrest patients.

**Methods:**

Adult patients after cardiac arrest were treated with TTM including moderate sedation and analgesia, intermittent neuromuscular blockade, cooling to 33-36° Celsius for 24 hours with the Arctic Sun device, rewarming over 12 hours. Bedside ICU nurses were instructed in use of the NeurOptics NPi-200 pupillometer, and asked to use it when assessing neurologic status of the patient. Clinical data were entered prospectively into the International Cardiac Arrest Registry database, and pupillometry data were downloaded from the Smartguard device blinded to outcomes and linked to time after ROSC. Outcome was considered poor (PO) if discharge Cerebral Performance Category (CPC) was 3-5, and good (GO) if 1-2. For each pupillometry assessment, data for Neurological Pupil index–NPi for the worst performing eye was selected. Data are presented as median (IQR).

**Results:**

55 patients were enrolled, with a median age of 57 years, 35 were male (65%), and 37 patients (69%) had a PO. The first pupillometry assessment occurred a median of 4.5 hours after ROSC, at which time 6 patients had unilateral NPi=0, and 4 patients had bilateral NPi=0; none of these patients survived. The initial NPi was ≤3 bilaterally in 15 patients and unilaterally in 5; 6 hours after ROSC, 18 of these 20 patients had bilateral NPI ≤3 (1 GO,6%) and 2 had unilateral NPi ≤3 (1 CPC=2, 1 CPC=3). 20 patients developed NPi=0 during TTM, a median of 6.4 (4.3-20.4) hours after ROSC; 1 patient (5%) had GO. The preceding assessment 2.7 (1.8-4.4) hours before revealed an NPi of 3.7 (3.3-4.0) with 3 values ≤3.

**Conclusions:**

Quantitative pupillometry provides descriptive data regarding the pupillary light reflex which may be superior to manual dichotomous assessments. Additional research regarding optimum monitoring strategies and triggers for intervention based on pupillometry is needed.

**Patient Type:**

Adult

**Category:**

Neuroscience

**Category Alternate 1 (optional):**

CPR/Resuscitation

**Keywords:**

cardiac arrest, in-hospital

cardiac arrest, out-of-hospital
encephalopathy
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